

This proposal aims to use the Rossi X-Ray Timing Explorer (RXTE) to detect both high and (1-3 s) and low (approx. 600 s) frequency quasi-periodic oscillations (QPOs) from 6 AM Herculis binaries. Simultaneous optical observations of QPOs will enable a more sensitive analysis to be made of these QPOs than in previous X-ray missions by specifying their exact time, phase, and period. Observations of 6 binaries enables a test of the relationship of frequency and magnetic field strength for the high frequency QPOs and observations of binaries of different orbital periods should enable us to distinguish between the two competing models of low frequency oscillations.

A key aspect of this proposal is to obtain simultaneous optical and X-ray data of our 6 targets, yet such observations have a number of constraints. First, most of our targets are in the southern hemisphere. Second, a 2 meter class or larger telescope and observations at low air-mass or near the zenith are necessary for adequate signal-to-noise data. Third, the effects of RXTE passing through the South Atlantic Anomaly (SAA) should be minimized. These constraints make Australia our best site for optical observations. During 1998 we were successful in obtaining observing time in June of that year at the Australian National University (ANU) 2.2 meter telescope in Siding Spring, Australia to do high-speed optical photometry. Unfortunately, our three nights of observing were completely rained out. In addition the ANU 2.2 meter telescope is used almost exclusively for spectroscopic observations and therefore ANU provides little support for photometry. In any case, the X-ray observations were performed as scheduled.

In 1999 we again proposed to do optical photometry at the ANU 2.2 meter telescope, but were denied observing time, though we had been allocated time on RXTE. The reasons for this appear to be twofold: 1) our lack of success during our 1998 observations and 2) ANU was no longer willing to support photometry on the ANU 2.2 meter telescope. This latter decision forced us to consider Chile and South Africa as alternate observing sites, even though the RXTE observations will be significantly affected by SAA passage. We therefore submitted proposals to the Cerro Tololo Inter-American Observatory (CTIO) and the South African Astronomical Observatory (SAAO) during the fall of 1999. The proposals were rejected for the following reasons: photometric observations on CTIO telescopes larger than 1 meter are only available for observers who supply their own instruments - we have none, and SAAO did not find the merits of the proposal compelling. Because of our misfortune and the difficulty of obtaining time at ground-based observatories, we decided no longer to pursue our objective of simultaneous optical and X-ray observations.

During 1999 and 2000, we made little progress on our analysis of the RXTE data. However during 2001, we have renewed our interest in this data and have begun analyzing some it. We currently have a preliminary draft of a paper entitled, "Phase Resolved Hard X-ray Spectroscopy of a Dipping and Eclipsing Polar V4132 Aquilae" which we intend to submit to Monthly Notices of the Royal Astronomical Society.

V1432 Aql is an unusual AM Herculis binary in that its hard X-ray component is much stronger than is typical for this class of cataclysmic variables (CVs). In addition the white dwarf rotation is not synchronous with the orbital period, but about 2 percent longer than the orbital period. This is also unusual, since the other three asynchronously rotating AM Her binaries have a white dwarf rotation periods that are shorter than the orbital period. Our preliminary analysis of V1432 Aql shows some unusual spectral characteristics near superior conjunction. At this orbital phase the accretion funnel appears to eclipse the hot spot where the accreted material impinges on the white dwarf surface. We find the temperature of the bremsstrahlung emission to be about 100 keV and the hydrogen column density to be about $2 \times 10^{22} \text{ cm}^{-2}$ or about 40 times the ROSAT value at this phase. Further discussion of V1432 Aql will have to await our interpretation of these unusual results.